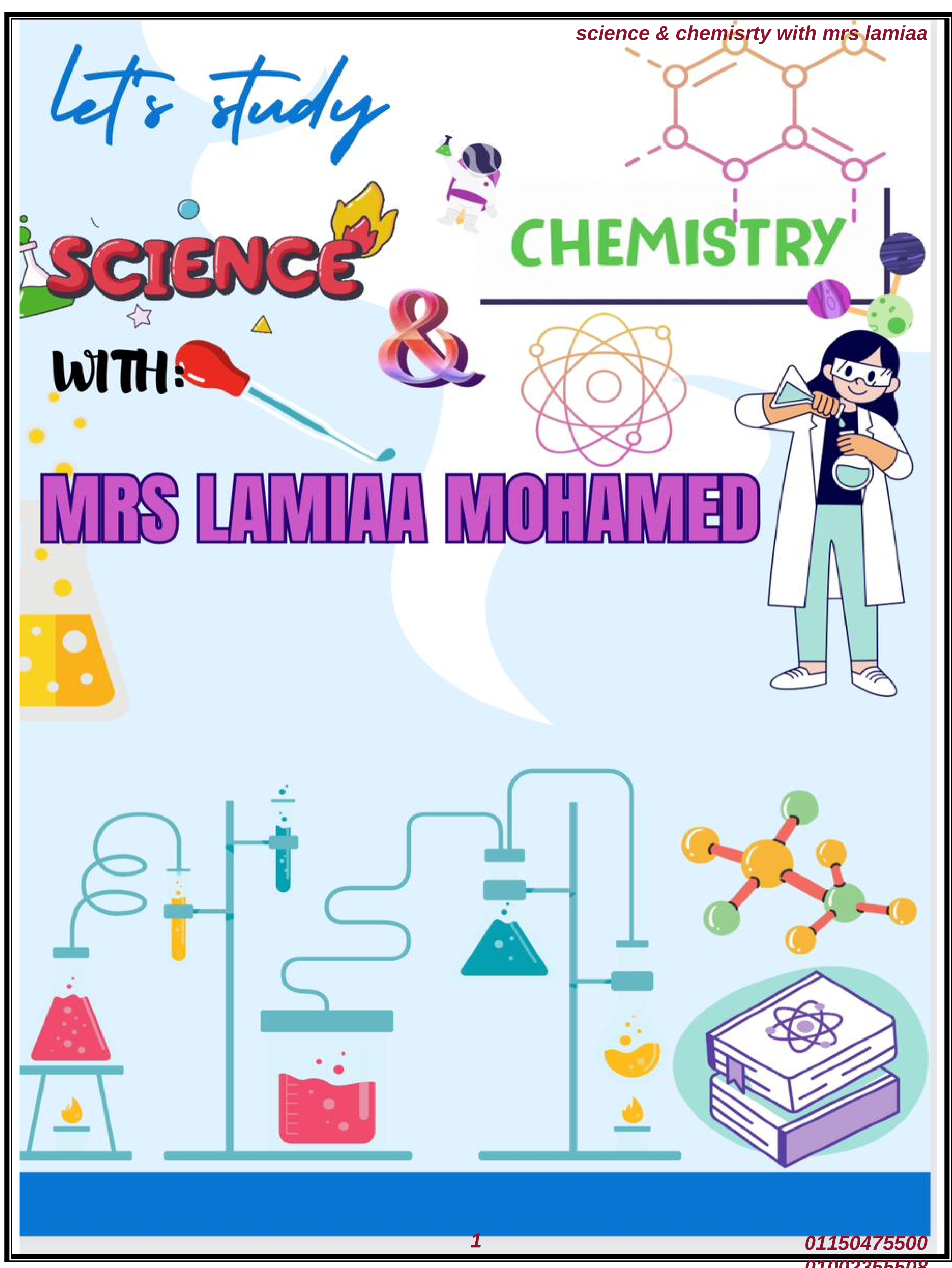


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grad 4 first term

Unit 1 : living system

concept 1-1 : adaptation and survival

lesson 1

the factor affect the life of living organisms:

1. Hot and cold temperature
2. amount of water
3. Availability of food
4. availability of shelter

Ex : -camel's body covered by thick hair skin ,to protect it from hot desert
- Palm trees has strong root , to fix them in soil from strong wind

Activity 2

Animals and plants adapt to environmental changes in order to survive

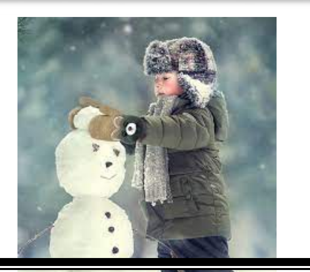
Starred agama lizard → find shaded area during sunny day to keep its body cool



Palm tree → covered by waxy layer to protect them from hot climate

Human → protect itself by using umbrella and light clothes





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Adaptation: ***It*** *is the characteristics that help living things survive and reproduce in an ecosystem*



Penguin feet :

- ***habitat***: ***in Antarctica live in polar climate (coldest place)***
- ***adaptation :***

1- its body is covered wit
- ***denes father and *thick layer of fat,***
- ***to keep body warm***

its feet
- ***:have no feathers***



how penguin's feet stay warm? Due to moving the blood in blood vessel through feet.

1. • **1-Blood vessels *bring cold blood up from the feet***
2. • **Other blood vessels *bring warm blood down to the feet from the feather - coated*** body
3. **3-These vessels weave around each other. •**
   When they touch, the warm blood vessels heat up the cold blood • vessels , so the heat transfers to the penguin's feet

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This means that the blood moving up into the penguin's body is not cold and the blood moving down to the penguin's toes is warm enough to keep its toes from freezing .

Give reason for

Penguins ' feet help them survive in cold climate

Because warm blood from the body weave around the blood vessels that carry cold blood from the feet . This leads to warming the blood vessels of the penguin's feet to survive in cold climate



Adaptation for survival



1-polar bear:

- **Habitat** : arctic (polar region)
- **Adaption :**

1- white fur to → blend in snow and sneakup prey

2-thick fur : → to stay warm



2-Brown and black bear:

- **Habitat** :forest
- **Adaptation :**



→ to hide among trees to hunt



1-Caracal and fennec fox :

- **Habitat :** desert
- **Adaptation :–**

have sandy → colored tan fur → to help them blend in desert



2-some desert lizards:

- **Habitat :** desert
- **Adaptation :**

colorful scales → to hide Among colorful rocks

Camouflage: its type of adaptation some animals use to hide from their predator or their preys by blend in surrounding

Lesson 2



Types of adaptaion

1. Structural adaptation

It is a change in the body structure of a living organism to help it survive

Examples • *The blood vessels in the penguin's feet*

2. Behavioral adaptation

It is a change in the behaviors of living organism to help it survive

Examples • *Desert lizard looks for shade during hot sunny days.*

Migration of some animals towards certain regions



1-Adaptation of fennec fox

Habitat : Hot dry desert



. Structural adaptation

It has a tan-colored coat (sandy-colored fur) that:

provides camouflage to hide in a sandy, rocky • protects it from the hot Sun.

• It has extra-large ears to cool its body

. Behavioral adaptation

-It pants like dogs to cool its body

-It lives in burrows to staycool during the sunny days

-It eats all kinds of food like insects, fruit, plant roots and even the remains from another animal's prey

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2- Adaptation of Arctic fox

Habitat: **Tundra desert** *with temperature as cold as (50°C) below zero in the winter months*

. Structural adaptation

- *-It has a thick fur coat to keep its body warm in cold climate*
- *-Its fur coat is white during winter but turns brown in summer when the snow melts to help it sneak up on prey in any season*
- *-It has short ears and legs to help it stay warm*

. Behavioral adaptation

- *-It lives in burrows to stay warm at night*
- *-It eats all kinds of food like insects, fruit, plant roots and even the remains from another animal's prey*

Give reason?

Both fennec fox in hot dry desert and arctic fox in cold tundra eat all kinds of food?

Because it is hard to find food in the hot dry desert and in the cold tundra

3-Adaptation of Bull shark*: has the ability to live in fresh and salt water*



Habitat: *Fresh water and salt water*

Structural adaptation

- *-It uses a camouflage strategy called " countershading " color contrast where it has a dark back and white belly to sneak up on prey*
- *-It has sharp teeth to cut prey's flesh*

Behavioral adaptation

- *-It eats different types of food as it lives in both fresh water and salt water .*
- *-It hunts during the day and at night , so it can surprise prey*

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When an animal swims above in the ocean , it may not see the bull shark due to its Dark back.

. White belly like the bright light of the Sun



Panther (Tiger) chameleon

- Lizard from reptiles
- its bodies are covered with scales

Adaptation of panther chameleon:

- **habitat:** tropical rainforest
- **structure adaptation :**





Ways of adaptation	How adaptation help animal
1-they have colored scales and peels Structural adaptation	*1-that help them hide among the colored flowers and green plants to hide from predators or to sneak up to preys*
2-it has a letter-shaped foot vStructural adaptation	*2- To hold the branches of trees*
3- Tail Structural adaptation	*3-to pick up things*
4- eyes Structural adaptation	*4- It can move each eye in any direction To catch preys and escape from enemies*
5-Body and mouth Behavioral adaptation	*5- When there is danger, it blows its body with air to make it look bigger and open her mouth to fear enemies*

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Lesson 3

Plant adaptation

- Plants have structural and behavioral adaptations that help them survive and grow in their environments

savannah forest

Ex Southern Africa

It is a grassland habitat with mild temperature there is extreme lack of water

Most of large plants. can't grow because has drought conditions

The temperature is mild,

Amazon

Ex Amazon rainforest of Brazil

The trees in the rainforest grow up to 70 meters tall, kapok tree (umbrella-shaped tree)

.rainy most of the year so it is easy to find water by strong winds

is hard for plants in the rainforest to reach sunlight.

- The rainforest has a soggy soil wet muddy soil.

First: acacia tree

(Umbrella – shape tree)

*Acacia tree lives in savannah forest in Southern Africa

Adaptation of trees to survive with their environment



Its habitat: *in savannah forest in Southern Africa.*

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Its structural adaptation:

Root

- *It has a very* long root grows directly downward *known as the* "taproot" *searches for water as* deep as 35 meters *below the soil.*

Trunk

- *Its trunk is* very long, *so most* animals *except* giraffe cannot reach *its leaves to feed on.*
- *Acacia tree* stores water *in its trunk.*

Leaves

- *It has tiny leaves to help it hold in water, while soaking up sunlight needed to make food.*

Its leaves have sharp spines

- *to protect them from hungry animals.*

Its behavioral adaptation: can defend itself as follows



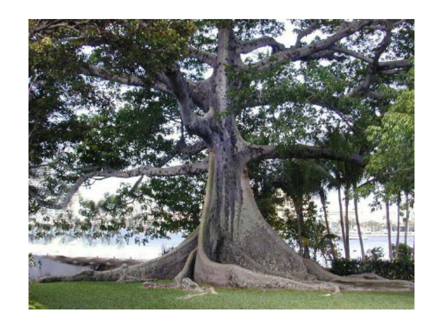
- - *When an animal begins eating the leaves of the acacia, the tree also begins to* produce a poison *that makes the leaves taste* very bad.



- *Then it* sends a smelly message *in the wind to acacia trees nearby telling them to* start making the same poison.

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Second kapok tree



(umbrella-shaped tree)

- *It grows in the Amazon rainforest of Brazil*



- Its structural adaptation:

Root

- *firmly rooted due to large, wide roots called* buttress roots.

Buttress roots

- *they grow high up on its trunk to hold the tree firmly in the soggy soil.* •
- Some of these roots can start up to 5 meters above the ground. •

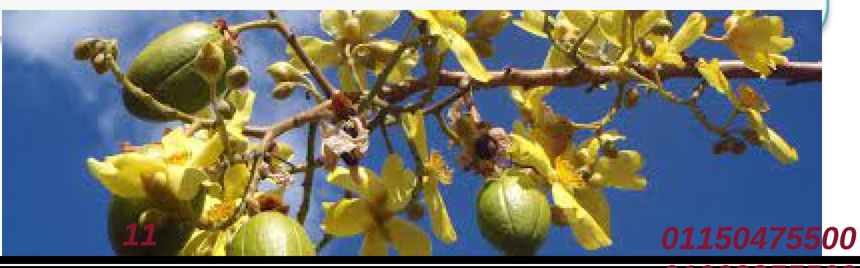
Leaves

It has hand-shaped leaves *with* narrow parts *that allow wind to move more gently through the leaves without tearing them* •

- **Its behavioral adaptation: -**

1. *The kapok tree* uses the wind to send a different type of messages *than the acacia,* •
   The kapok tree invites bats *to come visit its delicious-smelling flowers through these smelly messages.* •

2. - Kapok tree has fluffy yellow seeds *to be easily carried by wind across the forest* •



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Adaptation of some plants

Plant	Its habitat	Its structure adaptation	Reason
Mangrove tree	***Salt water***	***Long and strong roots***	***To resist water waves***
Water lily	***wetland***	***Wide leaves float on the water surface***	***To absorb a big amount of sunlight***
Palm tree	***desert***	***Thick root Small leaves***	***To resist the strong wind***
Pine	***snow***	***Leaves change to spins***	***To prevent animals to eat it***
Acacia tree	***savannah***	***Its branches grow and gather leaves on the top of its trunk.***	***prevent the animals from reaching the leaves of the tip of these branches***
Barbary fig	***Desert***	***Has sharp spins***	***To prevent animals to eat it***

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Lesson 4 the digestive system

System: *It is a group of organs that work together to do a specific function*

Digestive system: ***It breaks down food into small parts to enable the body cells to use them in getting energy.***

Digestion process: ***It is the process of breaking down food and the body absorbs and uses them in getting energy and growth.***

Human Digestive system

1) The mouth

Digestion begins in the mouth.

Mouth contains:

- **1. Teeth** – ***They crush food***
- **2. Saliva** – ***(it is a liquid substance in the mouth).. It moisten and break down of food***
- **3. Tongue** – . ***It*** mixes food with saliva ***in the mouth***

2-esophagus

2- Esophagus

- ***long muscular tube..***
- ***It*** allow food to moves from throat down into the stomach.



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3) The stomach

3) The stomach

- ***It is a muscular organ.***
- - Function of stomach:
- ***it*** mixes food with the stomach acid and digestive juices ***(enzymes) found in it to*** change the food into a soupy liquid.

4) The small intestine:-

4) The small intestine

- • ***It is a long, winding tube as its length is more than 6 meters.***
- • Food is broken down into simple nutrients in ***the small intestine,:***



- **Pancreas and liver** ***secrete*** **juices** ***to the small intestine.***
- **These juices** ***help in*** breaking down the food into nutrients
- **These nutrients** ***are*** absorbed ***through the*** wall of the small intestine ***as enter into tiny blood vessels and reach the blood.***
- ***The blood carries the nutrients to all parts of body.***

5) Large intestine

5) Large intestine

- • ***It is a tube that starts from the end of the small intestine and ends with the anus.***
- - Function of large intestine:
- **: It absorbs water from the undigested materials,**
- ***so they become solid wastes that come out through the anus.***

Keeping the Digestive System Healthy

1- Chew the food well
2- Don't eat much fast meals
3- Drink a lot amount of water

The human respiratory system

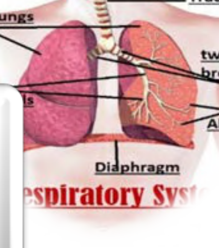
living organism respires to get oxygen gas *which is necessary* to burn the digested food *to get the needed energy for all the body activities*,

- **The respiratory system** is the system responsible for breathing (respiration)

*

Respiration process is a process of **entering the air carrying oxygen** into the body and **pushing the air carrying carbon dioxide** out of the body.

Structure of Respiratory System.



1-Nose and mouth

During breathing in (inhalation),



air enters through the nose and mouth *then down the throat.*



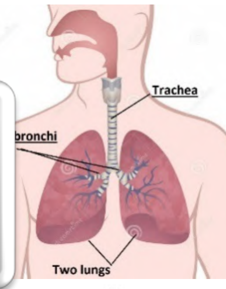
Throat allows the air to pass from nose to the trachea

2-Trachea :

- ***It is a tube that*** allows air to pass into the " two lungs



- Inside the lungs , the trachea is branched into two tubes known as " two bronchi "



3-Two bronchi :

- ***They*** allow the air to enter the two lung***s*** .



- ***They are divided into smaller and smaller tubes that look like the branches of a tree known as " bronchioles " .***

4-Two lungs –

Inside the lungs , the bronchioles end with little air sacs ,



surrounded by blood vessels known as " *alveoli* " .



- Inside the blood vessels , oxygen moves into the blood which carries oxygen around the body to help other organs and system to work

".

Diaphragm : -

It is a large muscle at the base of ribs

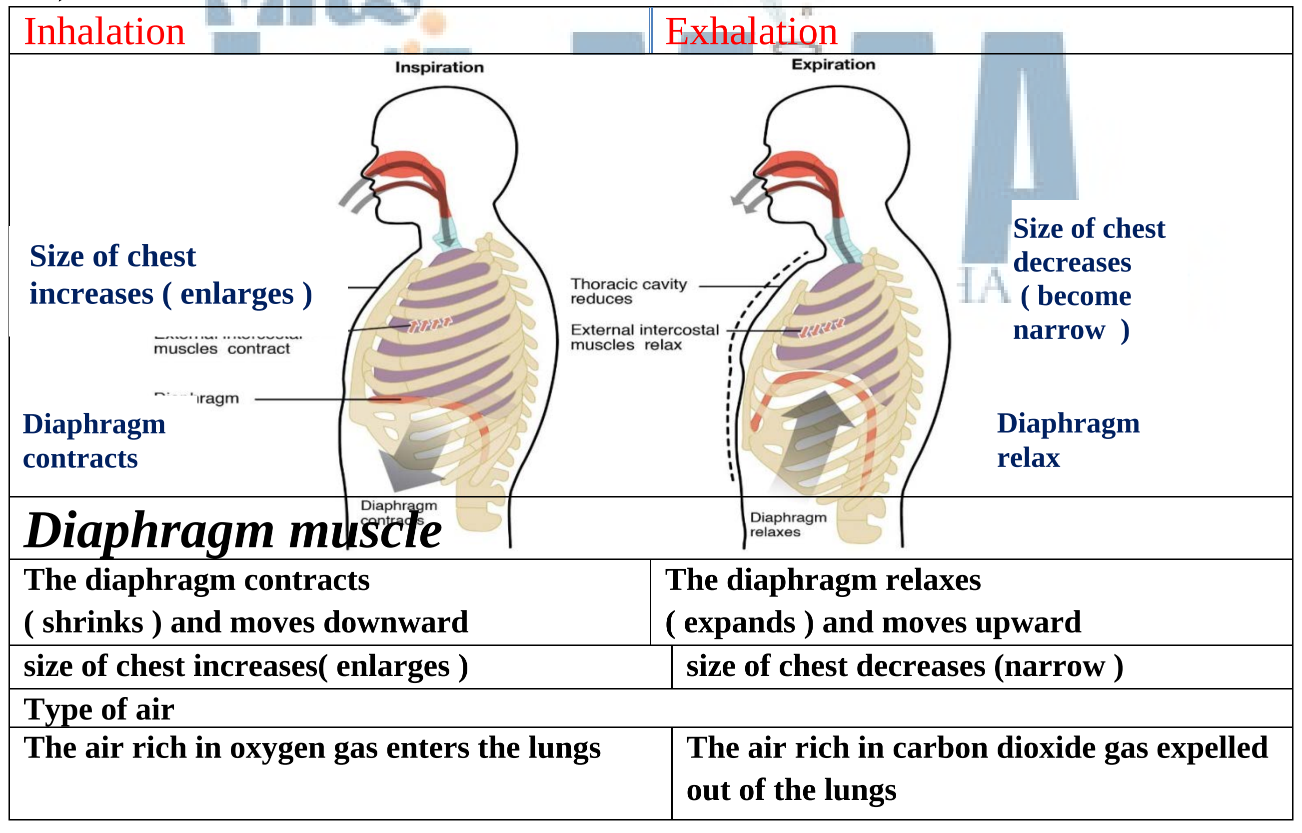


which plays an important role in inhalation and exhalation .

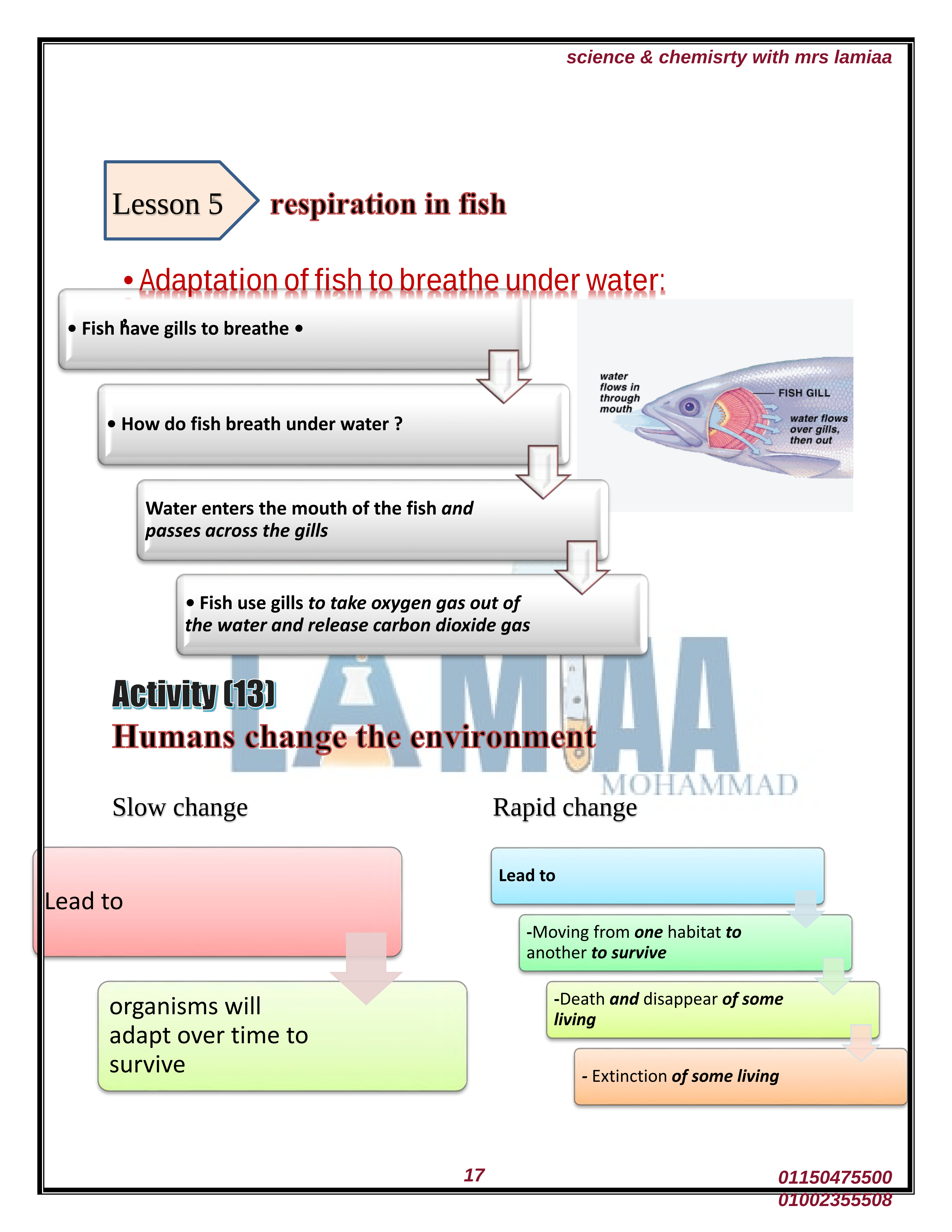
How does the respiration process take place

Respiration process includes : ***Inhalation (breathe in) . Exhalation (breathe out)***

Inhalation	Exhalation
Size of chest increases (enlarges) **Diaphragm contracts**	**Size of chest decreases (become narrow)** **Diaphragm relax**



Diaphragm muscle	
The diaphragm contracts (shrinks) and moves downward	**The diaphragm relaxes (expands) and moves upward**
size of chest increases(enlarges)	**size of chest decreases (narrow)**
Type of air	
The air rich in oxygen gas enters the lungs	**The air rich in carbon dioxide gas expelled out of the lungs**



Lesson 5 respiration in fish

• Adaptation of fish to breathe under water:

- Fish have gills to breathe •
- How do fish breath under water ?
- Water enters the mouth of the fish *and passes across the gills*
- Fish use gills *to take oxygen gas out of the water and release carbon dioxide gas*

Activity (13)

Humans change the environment

Slow change

Lead to

organisms will adapt over time to survive

Rapid change

Lead to

-Moving from ***one*** habitat ***to*** another ***to survive***

-Death ***and*** disappear ***of some living***

- Extinction ***of some living***

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Changes in the ecosystem are

A-Natural change





1. Change in temperature
2. Change in amount of rain
3. forest fire
4. Flood




2-human activities







1. cutting down tree
2. farming and cleaning land
3. Building communities instead of green land
4. - Introducing plants and animals into the environment
5. Air pollution from cars and some factories
6. Water pollution from throwing waste materials to water and soil




**changes resulted from human activities can cause the disappearance of plants and animals that once lived in an environment*

*human a plants and animals can survive .. Although the air , water and soil get polluted by

- by moving animals to another ecosystem

- land seed plant in a better place

Lesson 6

career and adaptation

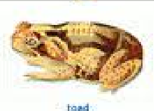
*In amphibians which are one of the most amazing living organisms on Earth .

Amphibians:

Amphibians









They are small animals that live on land and in water

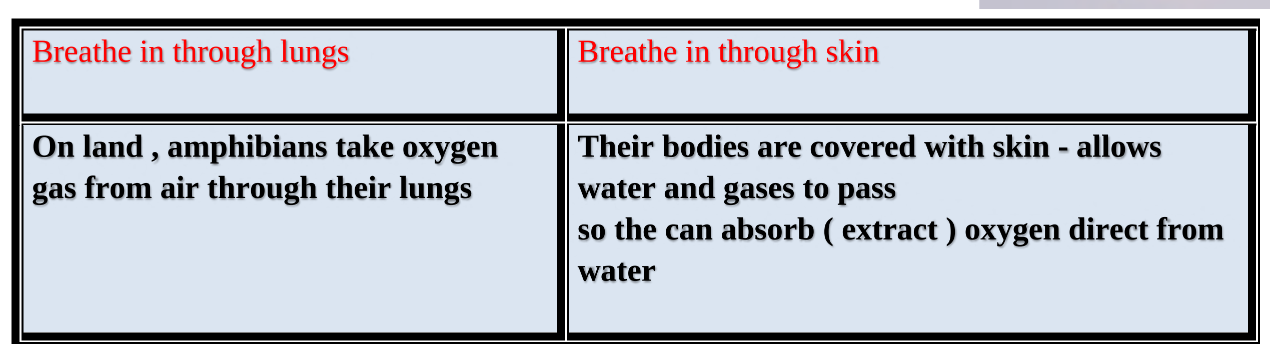
They can live in moist (wet) environments like rainforests , water streams and ponds .

Adult amphibians, can breathe using lungs when they are on land , but amphibians can also take in oxygen from water .

For example



• Amphibians breathe (respire) through their lungs and skin to adapt to live on land and in water as follows :



Breathe in through lungs	Breathe in through skin
On land , amphibians take oxygen gas from air through their lungs	**Their bodies are covered with skin - allows water and gases to pass so the can absorb (extract) oxygen direct from water**

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Concept 1-2

Senses at work

Lesson 1 how these living organisms

receive stimuli from their surrounding environments (such as, feeling hungry - thirsty - running away from enemies - cold... etc.) as well as how they are responding to them?

- *Humans can listen to music through the organ hearing, which is the ears*
- *Owls have extraordinary senses of hearing and sight to be able to find their prey in the dark.*



- *Dogs have very sharp senses of hearing and smell, therefore they are used in guarding.*

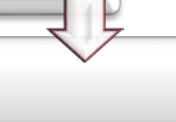


- *The Egyptian mongoose makes sounds that spread information to other mongooses to move from one place to another or when searching for food.*

SO, *Animals have senses like humans however, some animals have sharper sense of hearing or sight, or their strength lies in some other senses that enable them to communicate with each other using sounds or movements, so that they are able to adapt to their surrounding environments and can survive.*

Activity 2 Dolphin Super Senses :

- Hearing is one of the most important senses for all of us,





-Our sense of hearing allows us to gather information about the world around us.



• Dolphins have super senses that help them survive through

1.Finding food.

2. protect themselves under water

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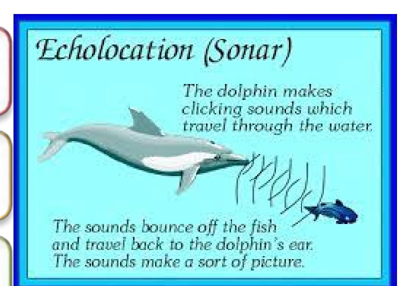
The most sharp sense that dolphins have is the sense of hearing, since they can hear all sound tones.

- *Dolphins use a property known as "**echolocation**" that depends on "echo" to detect the location of other living organisms and objects in the water.*

Echo: *It is the reflection (bouncing off) of sound waves back from a. solid surface source*

How dolphins use echolocation property

1. *Sound produced by dolphins travels in the form of waves called sound waves.*
2. *These waves travel through water, and when they hit objects, they bounce dolphins in the form of echo.*
3. *Echo helps dolphins locate their preys*



What Do You Already Know About Senses at Work?

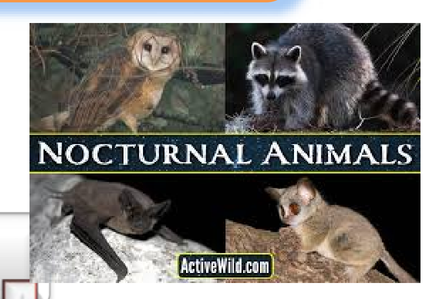
Animal	Purpose	Sense	Example
Fox	Avoiding danger	Hearing Sight	A fox uses its eyes and ears to runaway from its enemies, when seeing or hearing them
Chameleon	Searching for food	Sight - Taste	A chameleon uses its eyes and tongue to see and taste its food
Dog	Recognizing friends	Smell – Sight	smelling human scent
Monkey	Identifying things	Touch- Smell - Sight - Taste - Hearing	monkey uses its five senses to distinguish between things it eats or risks it face

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Lesson 2

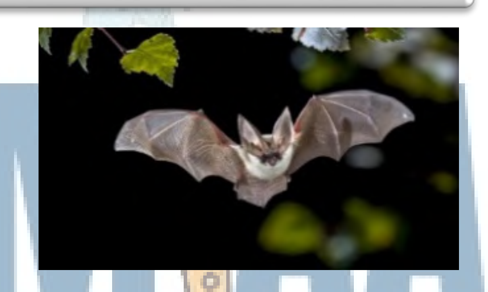
Activity 4 : **super sensory of nocturnal animals**

Some animals can look for their food at night using their super senses, these animals that become active at night are known as " Nocturnal Animals".



Why some animals become active at night ?

1. *Because the at night becomes* cool *enough.*
2. *Because the* preys *are* available *at night only.*
3. *to* hide *from their* preys *dark and surprise the*



Animals super sensory :

1. Bat Super Sensory Adaptations:

***Bats** cannot see **very well in the dark, but they are able to** use **echolocation property** (like dolphins)*



using** sound waves **to find their food in the dark using their hearing sense.



Purpose: *To* locate their preys *(as insects) and other bodies in their surroundings in the dark using the echo*

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2. Owl Super Sensory Adaptations:

- Owls have both extraordinary eyesight and hearing.

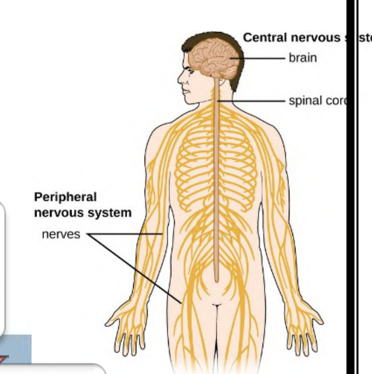
- The bowl-shaped faces and feathers in owls' heads help them detect, amplify and direct distant sounds directly into their ears.

- When animals making the noise are hiding within grass or under snow, the strong hearing sense of the owl allow it to detect their slight and faraway movements.

- Owls can rotate their heads in all directions, so that they can search for preys everywhere.

Purpose: To detect the movements and sounds of tiny faraway preys.

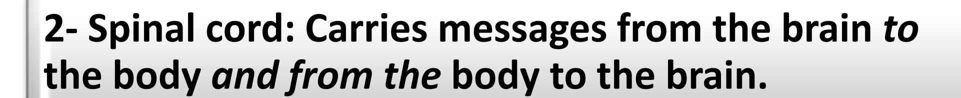
Activity 5 The Nervous System



Human nervous systems The nervous system consist of:

1 -Brain : *The* main control center *of the body*.

2- Spinal cord: Carries messages from the brain *to* the body *and from the* body to the brain.



3 -Nerves : Carry messages from the brain to the spinal cord and other parts of the body

The sensory organs *(eyes - ears - nose - tongue - skin) receiving information from the surroundings*

The nerves *spread across the whole body connect the sensory organs with brain.*

Sensory receptors: *They are nerves found in different places of the body, and they are responsible for receiving information from the surroundings.*

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Sensing the environment

Activity 6

***Nervous system* : responsible for movement When this small animal hears a snake moving nearby, it jumps quickly in less than one second.**





The different parts of the nervous system ***(sensory receptors, nerves, spinal cord and brain) are responsible for sensation and delivering messages.***

Jumping Jerboa :

The Egyptian jerboa is a species of desert rodents.
It is a tiny animal with very large ears, small eyes and long hind legs.

large and sensitive ears	(feet and toes have hair to help it catch sand when it jumps.	long hind legs that enable it
, so that it can hear quiet snakes,	*It hops in zigzag paths to be able to run away quickly from danger.,*	to jump *a long distance .*
Structural adaptation)	(behavioral adaptation	Structural adaptation)

*When snakes make noise as they approach a jerboa

-The sensory receptors in a jerboa's ears send a message through a network of nerves to the brain,

-The sensory receptors in a jerboa's ears send a message through a network of nerves to the brain,

-The jerboa's strong hopping legs starts to jump away from the danger in zigzag paths.

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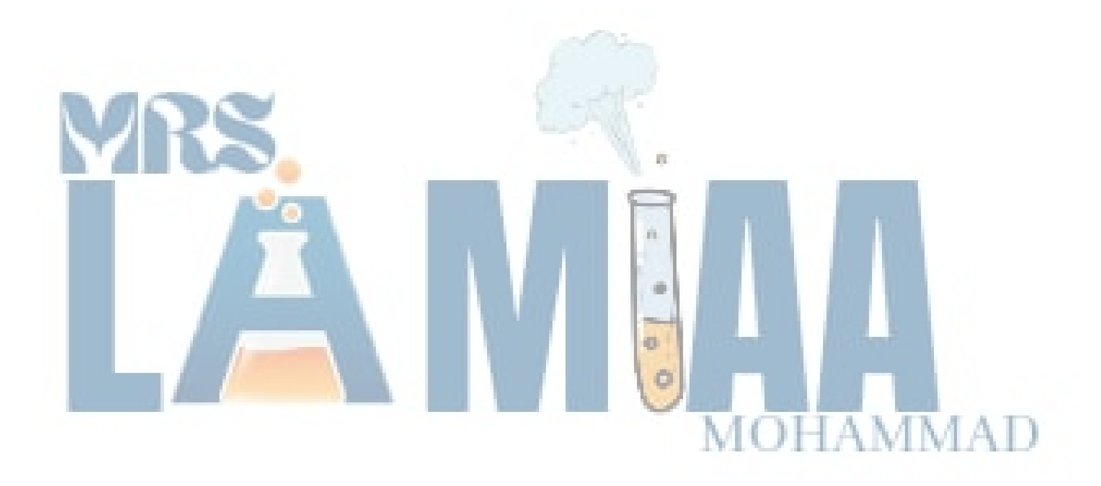
Reaction Time: ***It is the time taken by an organism's body to react to different stimuli around it. . like the jerboa.***

How does the jerboa respond to danger compared to a human?

Both human and jerboa ***avoid danger by relying on sensory receptors nerves and a brain to sense and communicate messages***

Both human and jerboa ***move quickly away from danger for their safety,***

:



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Lesson 3

Activity 7 Function of nervous system

1. • Collecting information through sensory organs like the eyes, ears and skin
2. • Make sense of translation these information to the brain
3. • . Understanding what this information means.



4. • Tell the body what to do. According to this information



Notes • *Some messages, which are called reflex actions, are so fast that you cannot realize it..*
• *Other messages are sent from and to the brain automatically, like the signal to breathe. Understanding*

Activity 12

Describing the Nervous System

• *The parts of the nervous system work together to :*

- Sense the environment . - Interpret the information to decide the best action . - Send a signal to the body to react .

• *Without all of the parts of the nervous system , the person might not receive , send or react to the information*

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Lesson 4 animal's communication system

Activity 9 how animals use communication system

***Human**

- *Technology help human to communicate through:*
- *a- Cell phone.*
- *b- Text messages and e-mail.*



animals

- *don't use technology but they can communicate using other systems:*



Ants

Ants live in colonies that contain thousands of individuals Where they have developed systems that help them divide their work *among themselves, so there are nurse ants, scout ants and soldier ants*

- **When the food is low,** ***nurse ants send smelly messages to*** **scout ants** ***which are responsible for*** **locating food.**



- **The scout ants** ***respond by*** **sending a smelly message** ***to alert the ants where to*** **find the food.**



- **The soldier ants** ***also use*** **smelly messages** ***to communicate if there is*** **danger nearby**ي

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songs of whales

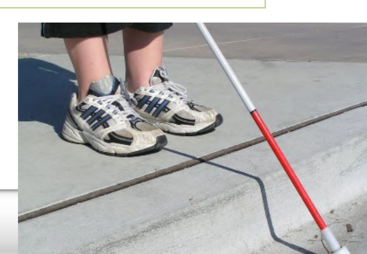
Humpback whales *sing under water to communicate with each other, where they sing a wide range of notes (tones) and a series of*

• Humpback whales *songs have different sounds depending on the season,*

In winter	In summer
Mating ***season.***	feeding ***season***
High - pitched sounds travel better in cold water	***Low-pitched sound travel better in warm water***
	Rough as "the voice of man"

Technology inspired by nature

Special cane: - used to help blind person.



1-It emits high pitched sounds like bats.

2- When sound hit any solid object, it reflects back to the cane.

3- The echo turned into vibrations, that sensed by thump.

4- This vibration tells the blind person if there is anything around him

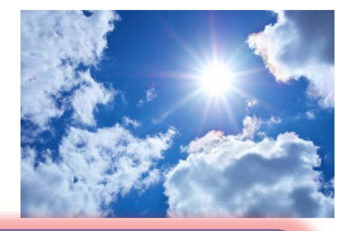
Special cane of blind person	Bat
Similar	
1- they emit a high - pitched sound that bounces off objects with an echo *2-they receive the echo that can tell the objects*	
Differences	
-The **special cane picks** *up an echo from the sound and changes it into a vibration that can tell the blind person where objects are around him*	**-Bats pick up an echo** ***but they don't change it into vibrations***

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Concept 1-3 light and sight

Lesson 1

light and sight



activity 1

Some animals *have some super sensory adaptations to survive.*
Humane and animals *have a nervous system that sends information from the sense organs to the brain through the nerves for processing and perception.*

the organ that is affected by light in humans and animals and how they can see things in low-light places:

The eye *is the organ of* sight *that is affected by* light *in humans and animals*.

Humans *cannot see in the dark, but they* need light *to gather*



Some animals *have a* spectacular night vision*, which enables them to see at night such as*

, human eye would need a night vision goggle *to see in the dark*.

Night vision animals

Fishing cat

- It is a wild cat *that hunts for food at night*

-The fishing cats eyes *seem to* glow *in the dark because*

• *It has a* mirror-like membrane *on the back of its eyes.*

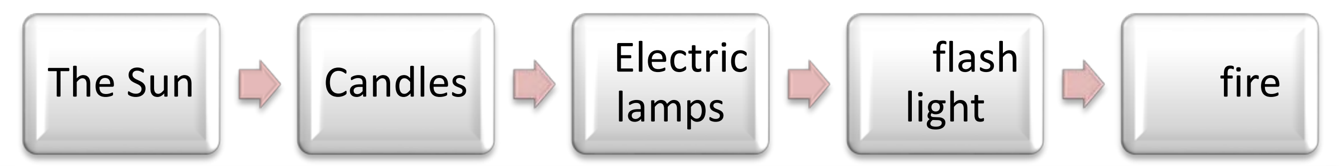
•

When the light enters *the* fishing car's eyes*, it* bounces off this membrane*, allowing the eyes to* collect more light.

The structural adaptation *of cats eyes that is found in all cats allow them to have excellent night vision to hunt in the dark*

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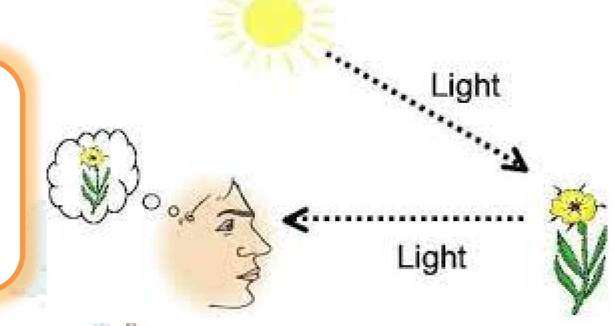
sources of light, such as:



There are other objects *that don't emit their own light, but* they reflect the light falling on them, *so they are not considered as sources of light such as:*
The Moon – Mirror

How we see:

When the source of light emits light rays that fall on objects, the light rays bounce these objects to our eyes to see them, as shown in the picture below.



Light:
It is a visible form of energy that travels in the form of waves.

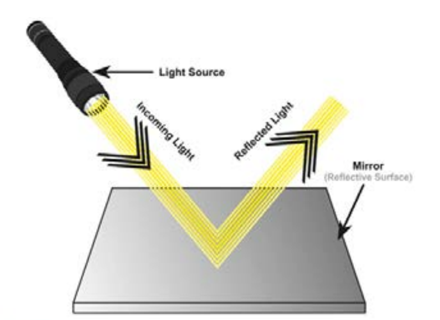
In complete darkness, *we can't see anything because without light bouncing off the objects into our eyes, everything will look black.*

Lesson 2

Activity 8 light Reflection







Activity 9
Light Strikes Matter

• Light *is a form of energy that always* travels in straight lines *in the form of* wave

When traveling light hits an object :

- *Some of the light energy is absorbed.*
- *Some of the light energy may go through the object.*
- *Some of the light energy reflects off (bounces off) the object's surface.*

• ***Objects that light cannot pass through are called "opaque".***

Opaque objects:

They are objects that don't allow light to pass through

Examples of opaque substances :plastic, wood and metal

Transparent objects:

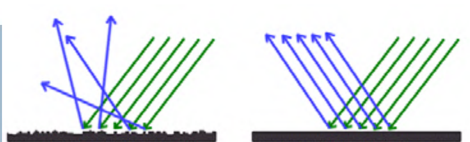
They are objects that allow light to pass through. Things can be seen through transparent objects.

Examples of transparent substances : air, water, windows and lenses.

Why do you see your shadow?

Opaque *objects (including the human body) always form shadows in the presence of light.*
Shadow happens *because all the light that hits the body either bounces off or is absorbed.*

So, none of the light passes through the body. •



The reflected light depends upon the smoothness of the surface :

Smooth Surface

- If the surface is smooth (such as a mirror), the light rays will reflect in one direction with the same angle at which they strike (hit) the object originally

Rough surface

-If the surface is rough (such as a painted surface), the light rays will the rays will reflect in different directions. Rough surfaces scatter or diffuse light.



The different types of communication in

Humans	Animals
• *Reading.* • *Writing.* • *Watching TV.* • *A cell phone.* *An electronic reader device(e-reader).*	***Echolocation***
Both *High-pitched sound. Displaying light.* • *Movements.*	

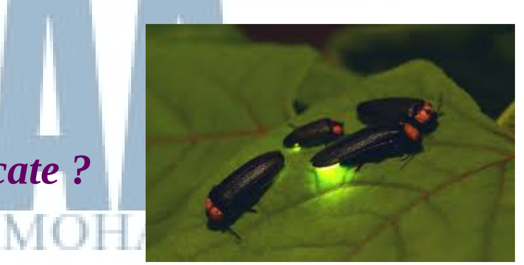
humans, animals and both :

We can conclude that ***animals and humans and receive information with different communication systems.***

Lesson 3

Activity 6 **Firefly Light Show**

How are fireflies used their senses to communicate ?



1. • ***Fireflies produce a chemical reaction inside their bodies that allows them to light up and communicate with other fireflies.***

2. • ***- Fireflies are winged beetles and they use their will communicate with each other by using the songs they produce as tor make musicngs to flash to warn off predators or to attract a mate to reproduce.***

3. • ***They naturally flash at regular intervals, but if there is another group of fireflies flashing nearby, they will change their own flash pattern and start over again to match the flash pattern of the other group to communicate.***



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lesson 4 Transferring Information



-The senses can be used to communicate information as.

1. Ears *use sound energy to gather information from the environment .*

2. Eyes *use light energy to gather information and communicate with others*

Eyes *can detect* signals *that travel very fast such as*

When eye sees a red traffic *light, it means you must to stop.*

Codes and transferring information

Code : pattern has meaning

When sense organs receive this information and send messages to the brain, the brain decodes and interprets the meaning.

-Codes	•*Thumbs-up or thumbs-down and traffic lights can be used to express simple meanings like good, bad, stop and go*
Expressions on faces	•*are codes that can help people predict our feelings such as: Thinking- happy - sad - angry •*
Language	•*is a code in the form of sounds, where different languages are different codes that are used to transfer information*
Writing	•*is a code that uses symbols in a pattern to give a specific meaning according to the arrangement of letters in a word*
Music or Sounds	•*that produced from humans, musical instruments, can be used in communication*
Lighthouses	•*send codes in the form of flashes of light that tell sailors where they are.*

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Unit 2

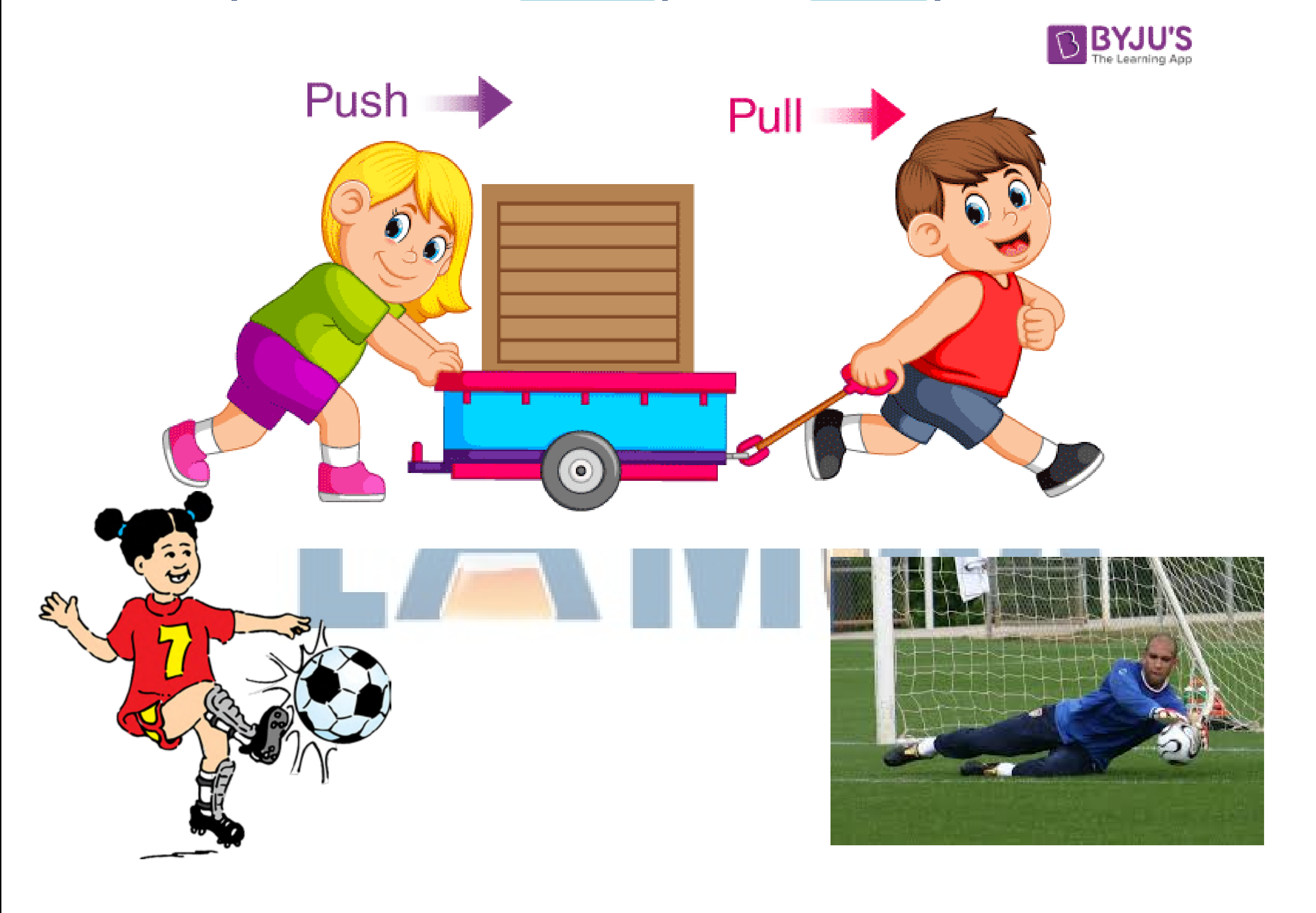
concept 2-1

Lesson 1

Starting and stopping

1- The objects require a force to stop or move

*2-This force could be a **pushing** force or **pulling** force.*



Push force **pull force**

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Truck versus airplane

The engines on a jet airplane are much more powerful than the engine in a truck So, jet airplanes fly much faster than moving trucks .

- This truck in is known *as the* shockwave truck *which*

has been fitted with three jet engines.



- Due to these three jet engines *, the shockwave truck can reach* speeds of over 500 kilometers an hour *,*

which means that it is about five times faster ***than the normal trucks.***



-to stop this car *They* put three parachutes *the driver opens to help* slow down the truck quickly

car movement

air

A cart with fire extinguishers

activity 3 Making Things Move



1

- -<u>On fixing fire extinguishers</u> *on car by Engineers.*

2

- *- When the engineers release air from the* <u>fire extinguishers</u>*, the* <u>air</u> <u>moves backward</u> *that makes the* <u>car</u> *begin to* <u>move forward.</u>

3

- -<u>By increasing the number of fire extinguishers</u>*, the* <u>speed</u> *of the cart* <u>increases</u> *and the* <u>distance</u> *that it moves* <u>increases</u> *too and vice versa.*

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activity 4 starting and stoping

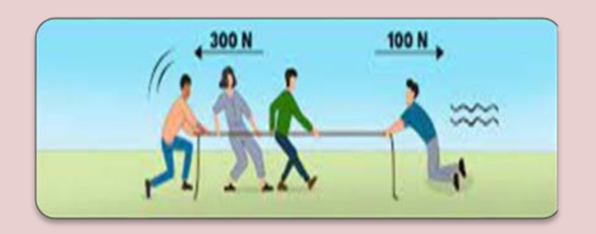
Balanced force

If the two teams are pulling the rope with equal forces, so the forces that act on the rope is balanced and the rope will not move



unBalanced force

-If one team is pulling the rope with greater force, so the forces that act on the rope is unbalanced and the rope will move to the team with the greater force .



-If the forces act on an object are balanced, so this object will not move.

-If there are unbalanced forces act on an object, so this object will move.

Activity 5 object in motion

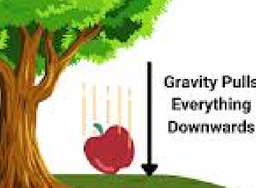
Motion : It is any change in the position of an object relative to a fixed point.

▸ Example of an object motion:

-When you throw the ball from your hand, it will move by the pushing force through the air.

-The ball will drop into your friend's hand by the pulling force of gravity

.Gravity It is the force that pulls objects toward the center of Earth.



Some motion is easy to see	-Some motion is hard to see ,:
Such as - A person walk-. *-A leaf blowing in the wind* *- A ball traveling in the air.*	*Such as -The rotation of Earth around the Sun.*

What makes objects move ?

• *Some-things move* **quickly**, *while others move* **slowly**

Force : ***It is a push or pull that is applied to an object causes it to change its position.***

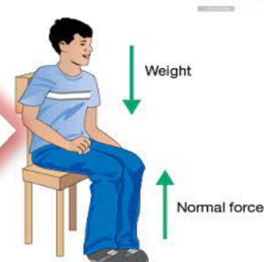


Is there any force affects us when we are not in motion ?

•**When you pull your bag up from the floor,** *there are multiple forces acting on the bag from different directions, where gravity pulls your bag down while your arm pulls it up.*



When you sit on a chair, *you may not feel that there is any force acting on your body. In fact, gravity is pulling you downward and holding you in the chair.*



Lesson 3

Activity 7 Stopping Motion

-Force of the same amount act on the object

- in opposite direction of its motion.

We can observe stopping force easily: -



1

- *When car crashes into a wall*

2

- *The car will stop. G.R?*
- *- Because the wall applied force on the car equal to the force that*
- *move the car*

Sometimes it will be hard to observe stopping force



1

- *When the car runs out of fuel.*

2

- *Its speed decreases gradually until it stops G.R?*
- *- Due to the friction force between: -*
- *1- Car tires and road.*
- *2- Air and the car*



Friction: ***It is a force that is exerted when objects rub against each other***

Friction force *always* slows down *or* stops motion *of moving objects*

• *The* direction of friction *force is always* opposite *to the direction of motion of a moving object.*

Activity 10 Rolling Cars

• **Hard push** — ***causes object to travel a long distance.***

• **Gentle push** — ***causes object to travel a small distance.***



If the same force act on two objects (car and truck): -

1- The object that has ***smaller*** *mass (car) will travel for* ***long*** *distance.*

2- The object that has ***bigger*** *mass (truck) will travel for* ***short*** *distance.*



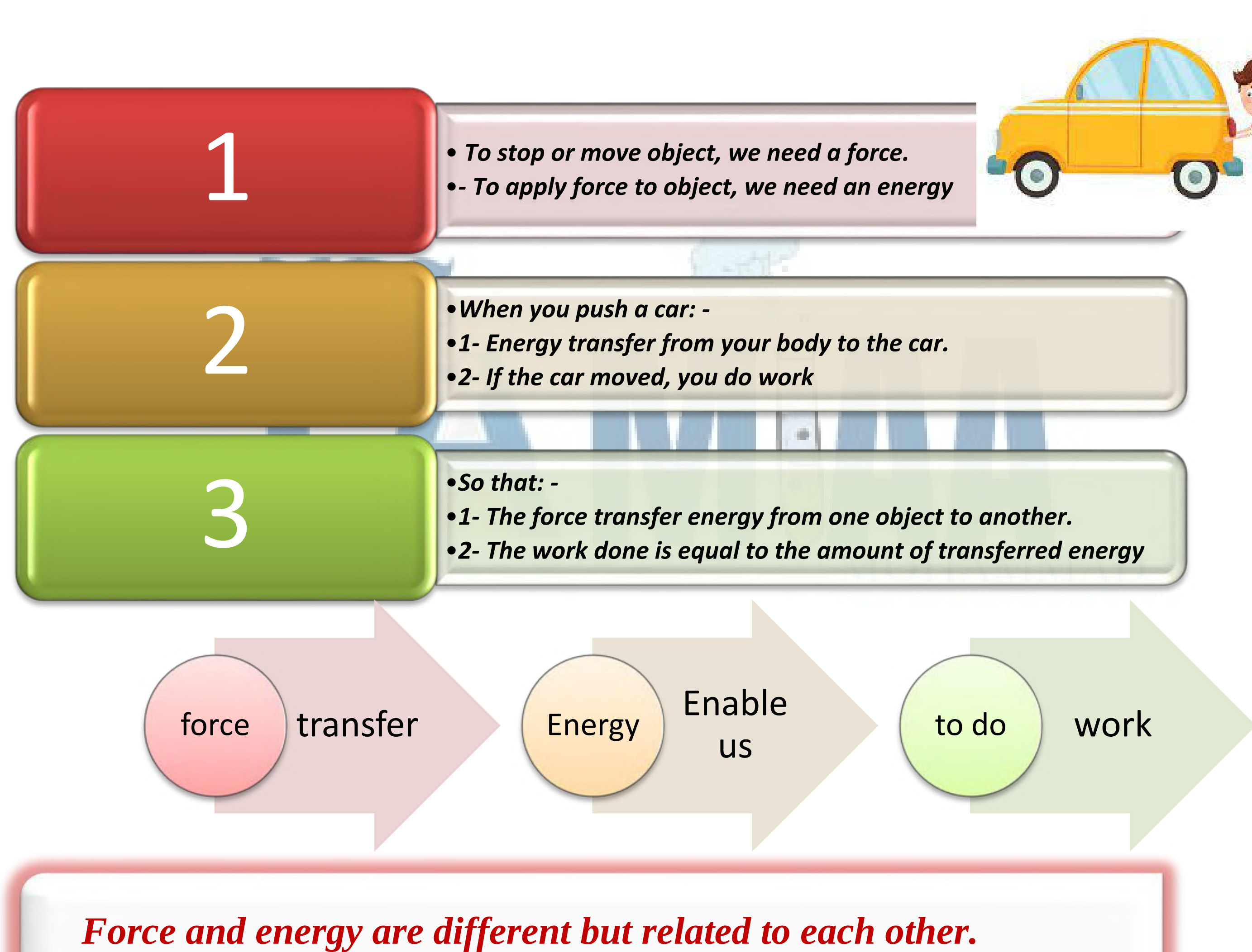
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Lesson 4

Activity 9 Energy, Work and Force

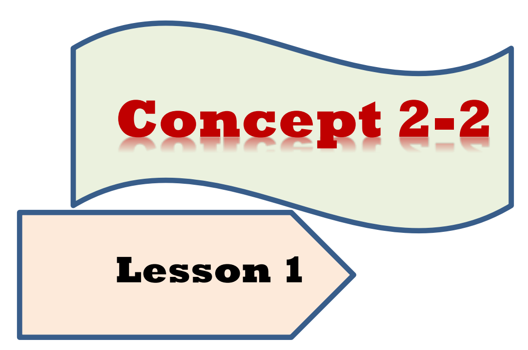
The relationship between energy, work and force •.

To make an object start or stop moving, this requires a force (either a push or a pull). · Applying this force to the object requires energy When you push the car, the energy transfers from your body to the car due to the force that your body exerts on the car.



Force and energy are different but related to each other.
Force is the effect that transfer energy and convert it into work

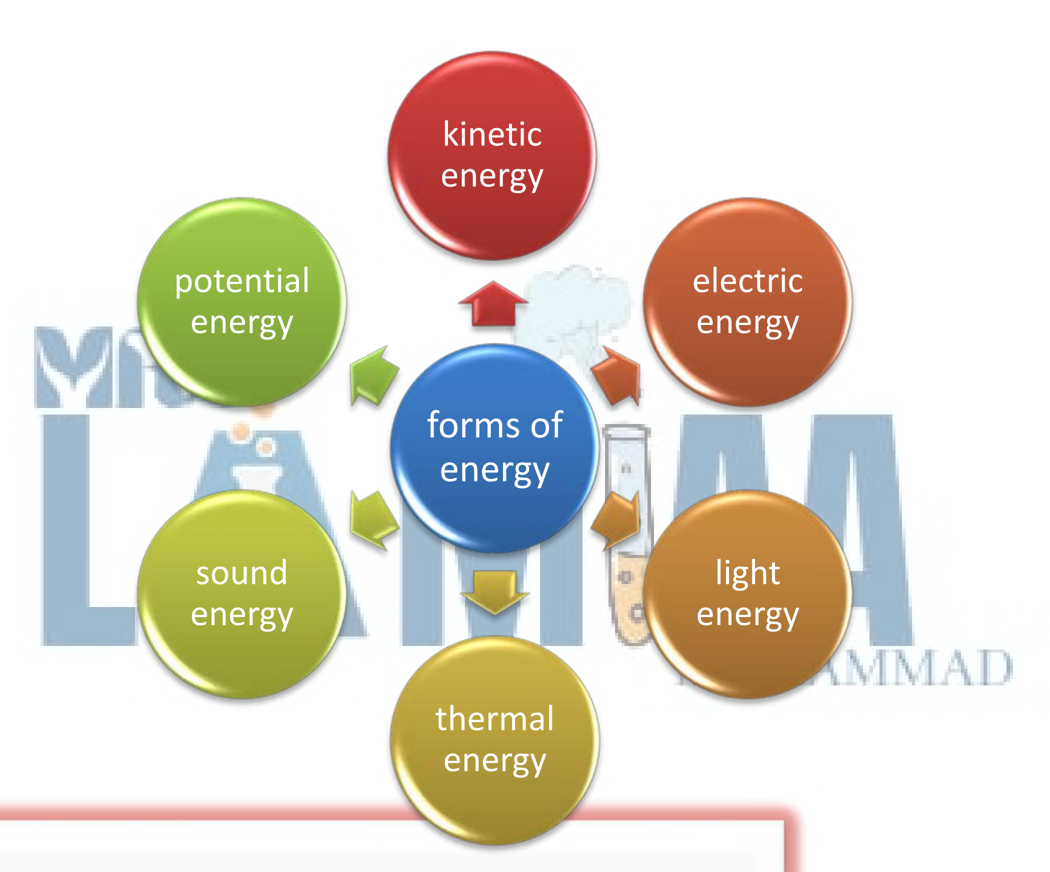
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energy and motion

Activity 2

Roller Coasters



-Any moving object has ***kinetic energy*****.**
- Static objects don’t have kinetic energy but they may have ***potential energy*****.**

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**** Al moving objects have a type of energy known as kinetic energy***

To know the source of energy that makes the train move with this speed, read the following steps:

1. •*At the beginning of the roller coaster, there are electric motors that work by electricity, these motors are used to carry the train cars up to the top of the hill.*
2. •*When the roller coaster reaches the highest point of the hill, the cars of the train actually store some energy during their rising to the top of the hill. (Potential)*
3. •*As the roller coaster moves down the hill, the energy stored in the train changes into a more active form of energy which is kinetic energy that helps it moves downward, so the train doesn't need electricity. While the roller coaster races down the hill, the energy increases as its speed*

A roller coaster moves from up to down. (its energy). → *The stored potential energy in the train is changed into kinetic energy.*



• *A roller coaster stops. (according to its kinetic energy).* → *Its kinetic energy becomes zero.*

Activity 3 energy and motion

Energy is very important in our life.

1- We get energy from food to help us grow and move.

2- Energy affects the objects and change their positions.

3- Operating all electric devices need electric energy.

4- Heat energy helps in cooking.

5- Lighting houses and streets.

Moving Energy

Energy moves (transfers from an object to another)

example that Shows a player kicks a bail as shown in the following steps:

1-When the player kicks the ball
Kinetic energy transfers from his foot to the ball.

2- Then the ball starts to move in the air. G.R?Due to transferring of kinetic energy to it.

3- When the ball gets inside the goal. Kinetic energy will transfer from the ball to the goal net.

4- The goal net will vibrate. G.R? Due to transferring of kinetic energy to it.



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Lesson 2

Activity 4 Energy Basics



Energy: It is the ability to do work or cause change.

Work: It is a force that causes an object to move a distance.

Energy inside stopped (static) object: -

1- When the static object is on the ground.
- It has no potential energy.

2- When the static object is at height from the ground.
- It has potential energy.

Facts about energy



Energy *can be stored and changed from one form into another form.*

Example: *When you hold a book, it stores a potential energy, when you let it falls down to the ground, the book is moving where the potential energy changes into kinetic energy.*



Most forms of energy can't be seen

Example: *Sound energy, thermal energy, electrical energy and chemical energy are forms of energy that can't be seen.*



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Lesson 3

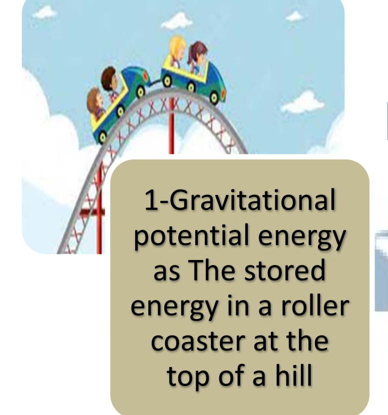
Activity 5 Kinetic and Potential Energy

1. Potential energy

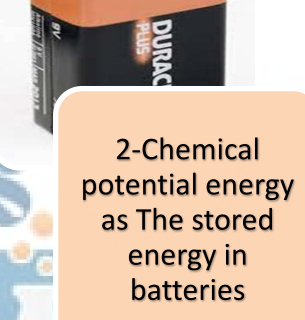
It is the amount of energy that is stored in an object due to its position.

Example : when you lift ball up away from the Earth's surface

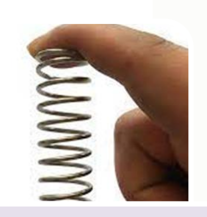
Forms of potential energy



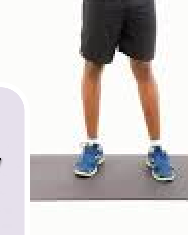
1-Gravitational potential energy as The stored energy in a roller coaster at the top of a hill



2-Chemical potential energy as The stored energy in batteries



3-Elastic potential energy as The stored energy in a compressed spring



Factors affecting potential energy: -

1- Mass of object.

2- Height from the ground.

There is a direct relation between the potential energy and the mass &height of the object.

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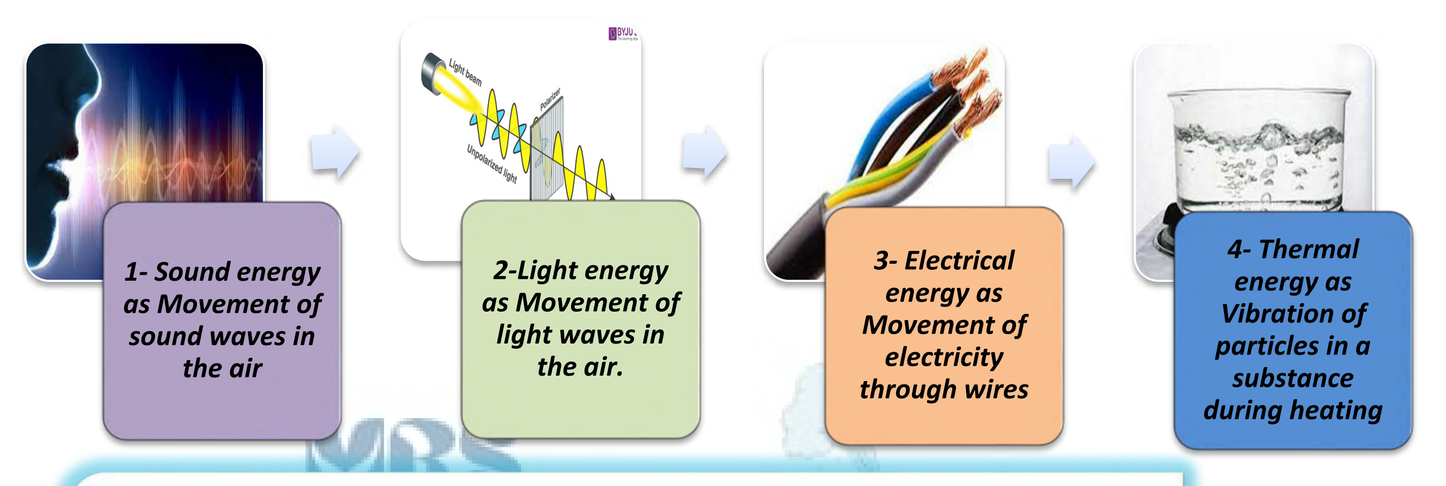


2. Kinetic energy

It is the energy of an object-due to its motion.

Example : when you let it falls down to the ground

Forms of kinetic energy



Energy can be ***transferred*** from on object to another.
Ex: when you kick the ball.
Energy can be ***transformed*** from one form to another

Device	Energy change From	to
1-Flashlight	**chemical** that stored in battery.	Light and heat
2- Gas oven	**Chemical that stored in natural gas.**	**Thermal.**
3- Spring powered toy car.	**Potential stored in spring.**	**Kinetic, sound and thermal**
4- Real car.	**Chemical energy in gasoline.**	**Kinetic energy**

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Not

-Energy stored in many forms.
- new energy cannot be created, and existing energy cannot
be destroyed.
- Food store chemical energy.



Lesson 4

Activity 8 Easy life tool

Tool name: robot hand.
Function: used to open jar cap
Source of energy: battery

Chemical energy stored in battery → convert to → **Electric energy in the robot hand.** → convert to → **Kinetic energy on moving hand.**

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Concept 2-3 energy and collision

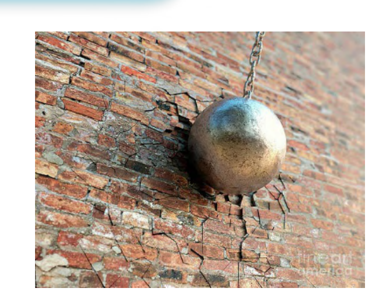
Lesson 1

collision



the truk Faster and heavier object	the car Slower and lighter object
more speed	less speed
more mass	less mass
- Has more energy.	- Has less energy.
- Cause more damage	- Cause less damage.

Collision: It is the crashing of two objects with each other



The wrecking ball: *It is a heavy steel ball that swings on a cable*

The wrecking ball: *It used in knock down building*

When a train collide a car, the car damage as

A heavy object has more energy (train) causes more damage for object has light low energy



As the speed and force of the collide object increase, the damage increases

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Cricket game: *A player use a wooden bat to hit a ball with high speed*

.

The bat *transfers its kinetic energy to the ball, its speed increases making pop sound*

When car driver stop the car suddenly, *your body move forward*

Cars safety equipment

1-Car belts: *They are used in cars to keep our bodies from car collision (move forward)*



2-Air bag

Their structure *Airbags are made up of thin nylon material folded into the steering wheel, seats, dashboard or doors. Idea of operation*

During collision, *airbags inflate automatically when sensors in the car detect a crash A sensor tells the airbags to inflate and fill with a gas to provide a soft cushion*

*-**After collision**, the airbags deflate almost as fast as they inflate, because they have holes (vents) to allow them to deflate, so the driver can get out of the car*

Their importance

Airbags *slow the speed of the driver's motion forward. -Airbags absorb - the energy of the car on collision.)*

-Airbags slow the speed of the driver forward

-Airbags absorb the energy of the car due to its collision

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Airbags deflate quickly after few seconds of collision

they contain small holes (vents), through which the gas comes out, so the driver can get out of the car

Collisions between trains and cars

Trains are much larger than cars. Also, trains can travel at a high speed
It is more dangerous, as the force of the collision between the car and train increases

Lesson 2 basic of speed

Speed: distance traveled in time

$$\text{Speed} = \frac{distance\ (km\ or\ meter}{time\ (second\ or\ hour)}$$

The measuring unit of speed *may be : Kilometer Per Hour (km/hr) Or Meter Per Second (m/sec).*

factors required to know the speed:

- distance .
- time .

**The speed of an object is not affected by the direction of this moving object*

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Problems:

1-Amir runs 100 meters in 20 seconds. Calculate the speed of Amir

=**Speed** = $\frac{distance}{time}$

=*Speed* = $\frac{100}{20}$ = =5 m/sec

2- Bus travel 600 kilometers in 5 hours calculate the speed -

=**Speed** = $\frac{distance}{time}$

=*Speed* = $\frac{600}{5}$ =120 km/h

Comparing speed of two moving objects: -



1- If two moving objects move at equal periods of time: -

- The object which cover ***longer*** distance is ***faster*** ***(has greater speed)*** than other object that cover shorter distance.

2- ***If two moving object cover the same amount of distance: -***

- The object which travel the same distance in ***smaller*** amount of time is ***faster*** than other object which take more

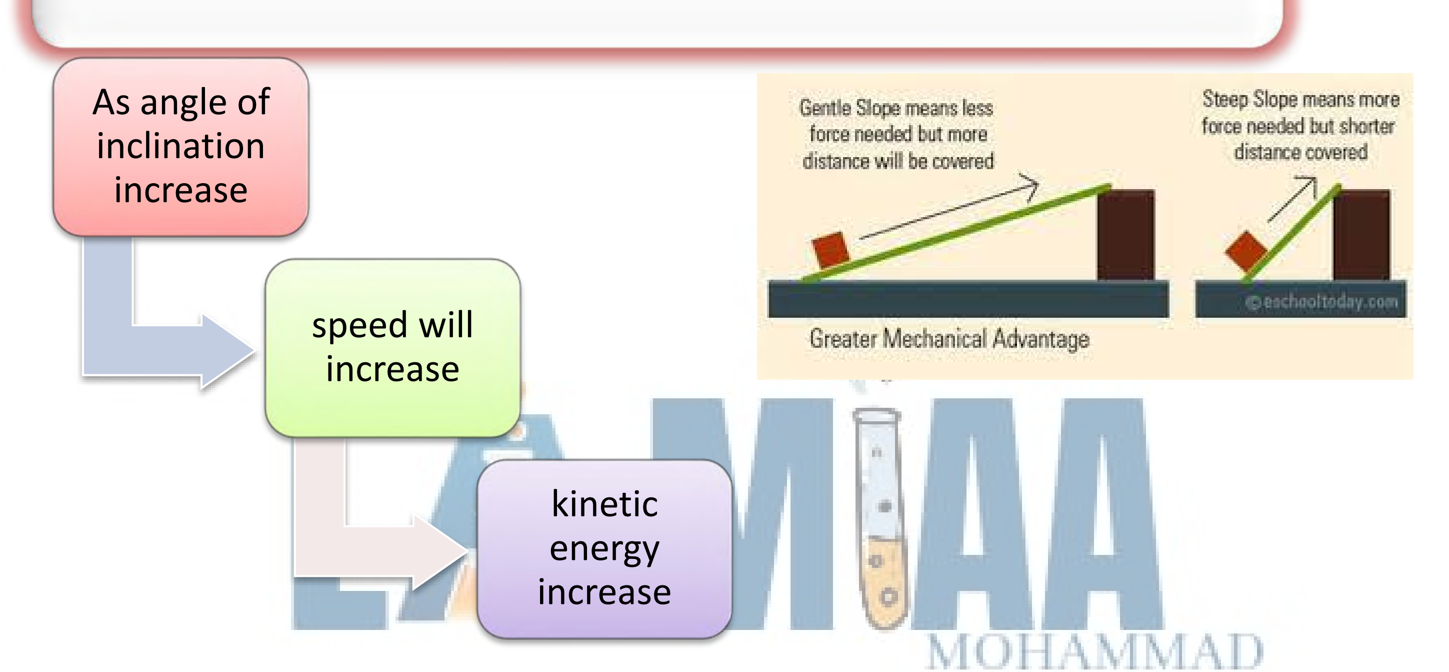
Activity 5

Racing Downhill

The relation between the speed and the angle of inclination.

.

Both speed and kinetic energy increase, as the angle of inclination increases



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Lesson 3

Activity 6, energy and collisions

Collision :
it's the bumping(or)crashing of two object into each other

when object collid with each other
-an amount of kinetic energy transfer between them
-part of kinetic Change of energy sound energy

Activity 7 Effect of speed on collision

Kinetic energy depends on: -

1- Mass.

2- Speed

fast object (more speed	slower object (less speed
has more energy (kinetic)	has less kinetic energy.
it exert more force.	it exert less force.
- cause more damage	- cause less damage.

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Driving fast is very dangerous, *because if a car increases its speed, its kinetic energy increases that results in exerting a large force during an accident*

What happens if....?

1-Two cars move at different speeds in opposite directions collide with each other?

The forces exerted in the accident depend on the speed of both cars, so damage would be much more severe because they move in opposite direction

2-Two cars move at different speeds in the same direction collide with each other

The forces exerted in the accident depend on the speed of both cars, this leads to damage that would be less severe because they move in the same direction

Lesson 4

Activity 8 speed and collision

the force acting on object increase → , kinetic energy increase

its speed will increase. → So its kinetic energy increase also

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• What happen If you have a clay ball and threw it: -

- the amount of deformation depends on the force acting on the ball.
- When you let the ball without pushing, its shape change slightly.
- While let ball with pushing, cause more change in shape.

Relation between mass and kinetic energy





- Small mass	- large mass
Small engine	big engine
Consume less fuel.	- Consume more fuel.
Less kinetic energy.	More kinetic energy.

Activity 10 transformation of energy during collision

- **Newton cradle:**

1

- When you hold ball as figure: -
- - The ball
- 1. store most potential energy
- 2. has no kinetic energy (static

2

- When you let the ball move: -
- potential energy changes into kinetic energy.
- 1- potential decrease
- 2- kinetic increase

3

- During collision: -
- - Energy transferred gradually from
- each ball to the next one.
- - Number of balls on both sides is equal.

4

- Eventually: -
- - some energy changes into sound
- and thermal energy.
- - some energy lost due to friction
- between balls and string&(friction between balls with air)

After a lot of collisions, balls will stop. G.R?

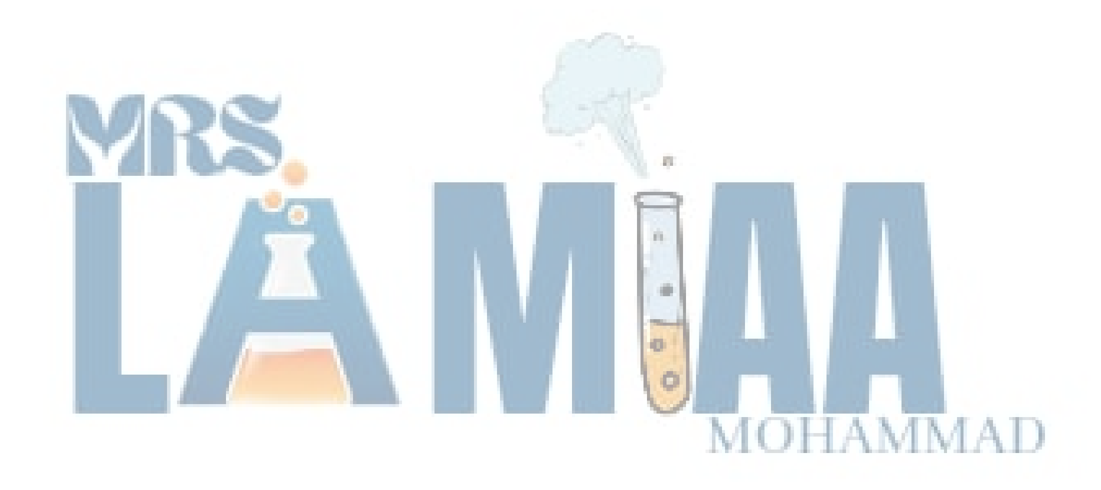
because part of energy lost in friction between balls and air.
Energy is conserved during collision (cannot be destroyed)
The amount of energy before collision = the amount of energy after collision

With best wishes

∞ Science & chemistry

Mrs. Lamiaa mohamed

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MRS
LAMIAA
MOHAMMAD